portion can be able to be returned for the working of the furnace itself.1 Of course, here the available heat of the heating gases given off by the producer is taken into account, since if this entered cold into the furnace, the outlet temperature of the waste gases could obviously be lowered. A direct utilisation of the available heat of the heating gases scarcely admits of being accomplished, as it presents too many technical difficulties. Besides, the total available heat of the heating gas again is present in the waste gases, and if one could abstract the heat from the latter, one thereby also would have found the solution for the former problem.

The advantage which one could obtain by production of steam-air gas with preheated air, admits of the hope that the available heat of the waste gases could be eventually utilised for this purpose, and it is interesting to learn how much the amount of heat turns out to be which would be thus won back. For the gasification of 1 kilogramme 0 from good "black" coal in the producer, with gas of average composition (p. 78), about 4 cubic metres air was required, and if this were preheated to 500° it must have had 0'326x 5500x4 = 653 calories expended on it. Of the about 3,000 calories per kilogramme C which are uselessly drawn off into the chimney, one could therefore render one-fifth useful, whilst four-fifths, or about 2,400 calories per kilogramme C, would still be lost.

## REGULATION OF TEMPERATURE IN THE COMBUSTION CHAMBER.

The principal function which an open-hearth furnace for steel production must fulfil is to provide a flame at high temperature, which is capable of equally sweeping the entire hearth, and clinging to it like a soft rug.

The flame originates as a consequence of the union of gas and air; nevertheless each gas molecule can only form a portion of the flame a short moment, viz., only at the instant of combustion, in which it bursts into flame, at once to be put out. Hence the production of a long flame is only possible, if in

1 The latest plans with different firing systems, namely the replacement of chimney draught by mechanical means, admits also possibly of being employee I in open-hearth furnace working. By this means this question possibly would appear in a different light.